Installation manual

PART 2/2

MANUFACTURER	Ford
TYPE	(based on Transit Courier RHD)
ENGINE DISPLACEMENT	998cc / 999cc
NUMBER OF VALVES	12V
ENGINE CODE / NUMBER - OUTPUT	SFCA / SFCB / SFCC / SFCD - 74kW SFJA / SFJB / SFJC / SFJD - 74kW
FIRING ORDER	1-2-3
VEHICLE CATEGORIES	M
TRANSMISSION	AT/MT
VERSION	AFC-2.1 DI-LPG
TYPE VSI INJECTOR	KN9 - 52cc
TYPE INJECTION MODULE	Gen2 Type 1
PETROL ECU MANUFACTURER / CODE	Bosch 0.261.S08.993 (658) / 0.261.S09.317 (658) / 0.261.S11.319 (658)
MODEL YEAR:	2012-
SYSTEM APPROVAL NUMBER (R115)	E4- #115R-000021 / VSI-LPG 32
LOCATION R115 SYSTEM STICKER	right side, centre door post
ENGINE SET NUMBER	347/121016/A
MANUAL NUMBER	076/0709900
DATE	2020-10-09

Revision version: -

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FOR EXPLANATION AND CIRCUIT DIAGRAMS SEE : INSTALLATION MANUAL GENERAL PART 1 / 2

Manual updates / revision

Rev. nr	Rev. Date	Subject update
-	2020-10-09	Release

General instructions

- The installation of the system shall be done in accordance with the installation manual provided by Prins Autogassystemen.
- This manual is based on Dutch regulations; always install the system in accordance to the local regulations.
- Always download the “general manual 1/2“ from our website for basic instructions and diagrams.
- Always disconnect the battery when installing the LPG system. Make sure the ignition key is outside the car. Be aware of central door locking, radio / telephone memory code and alarm system.
- Do not place the main fuse into the fuse holder before having completed the installation of the VSI system.
- The VSI computer has to be activated by means of the diagnosis software.
- In the unlikely event the AFC fails, it will automatically switch over to petrol.
  Never disconnect the AFC connector, unless you have removed the main fuse.
- When installing the VSI wiring harness, ensure that it does not run near any of the ignition components.
- Solder and insulate all electrical connections.
  The wires in the loom are provided with numbers and text.
  The text on the wire explains the function of the wire.
  The wire harness is not model specific, therefore it may be necessary to adjust the length of the wires.
  Ensure maximum care is taken when connecting the wiring.
  Make professional joints using solder and shrink sleeve. Do not stretch the wiring harness.
- No component of the LPG-system shall be located within 100mm of the exhaust or similar heat source, unless such components are adequately shielded against heat.
- Remove any internal burrs after having shortened the LPG pipe.
  (This guarantees the maximum flow through the pipe without pollution.)
- If holes have to be drilled (wear safety glasses) for installing brackets, etc., the drilled holes must always be treated with an anti-corrosion agent after the chips have been removed (especially when mounting an exterior filler into the body work).
- After having completed the installation, check the whole system for gas leakage; use a gas leak detection device. Also check for any leak of engine coolant, petrol and air.
- Fitting and maintenance is only allowed by Prins Autogassystemen selected LPG engineers.
- Failure to follow the instructions in this manual can result in a poor or non-working LPG-installation or a dangerous situation.
- For maintenance instructions and filter registration see owner’s manual.
- Prins Autogassystemen is not responsible for any damages to people or objects as a result of changes to Prins products.
- Check our website regularly for diagrams, certificates, updates, info-bulletins and product information.

Please fill in the warranty portal completely within 14 days after installation.
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Required equipment / tools / materials for installing a complete system

- Complete workshop toolbox (wrenches, screwdrivers, cutters, pliers, ratchet, sockets)
- Car lift
- Portable computer
- Vehicle fuel system scan tool or OBD scan tool Prins (part no. 099/99928)
- Exhaust gas analyser
- Multimeter
- Oscilloscope
- Prins diagnostic software
- Prins Diagnostic Tool
- Torque wrench (5-50Nm)
- Torque wrench (200-250Nm)
- Portable light
- Assortment drill bits Ø4 to 12 mm
- Assortment cutters (Ø20, 30, 50, 70 mm)
- Portable drill or pneumatic drill
- Thread cutting device (male M6x1, M8x1, M10x1)
- Air gun
- Vacuum cleaner
- Safety goggles
- Hot air gun
- Soldering iron, soldering tin
- Wire-stripping pliers
- Adhesive tape
- Adhesive sealant
- Thread locking compound
- Anti-corrosion agent / black body coating
- Gas leak detection device or foam leak spray
- Shrink sleeves

Vehicle check

- Check the vehicle drivability on petrol
- Check the fuel system for error codes (scan tool)
- Check if the catalytic converter is in good condition (exhaust gas analyser)
- Check the condition of the ignition system (spark plugs, cables, coil)

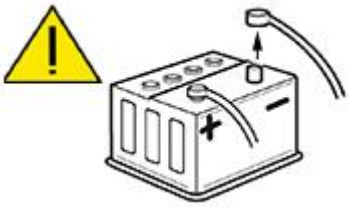
Tightening moments / Symbols

		Nm	Spanner mm
M5 x 0,8		6.5	8
M6 x 1,0		11.3	10
M8 x 1,25		27.3	13
M10 x 1		52	15-16-17
M10 x 1,5		54	15-16-17

LPG manifold nipple		1	3.5 Allen
Reducer nut - bracket		10	13
Lock-off nut		15	16
Fuel line nut – lock-off		20	13
Fuel line tank – lock-off		20	16
Filling hose connections		50	22

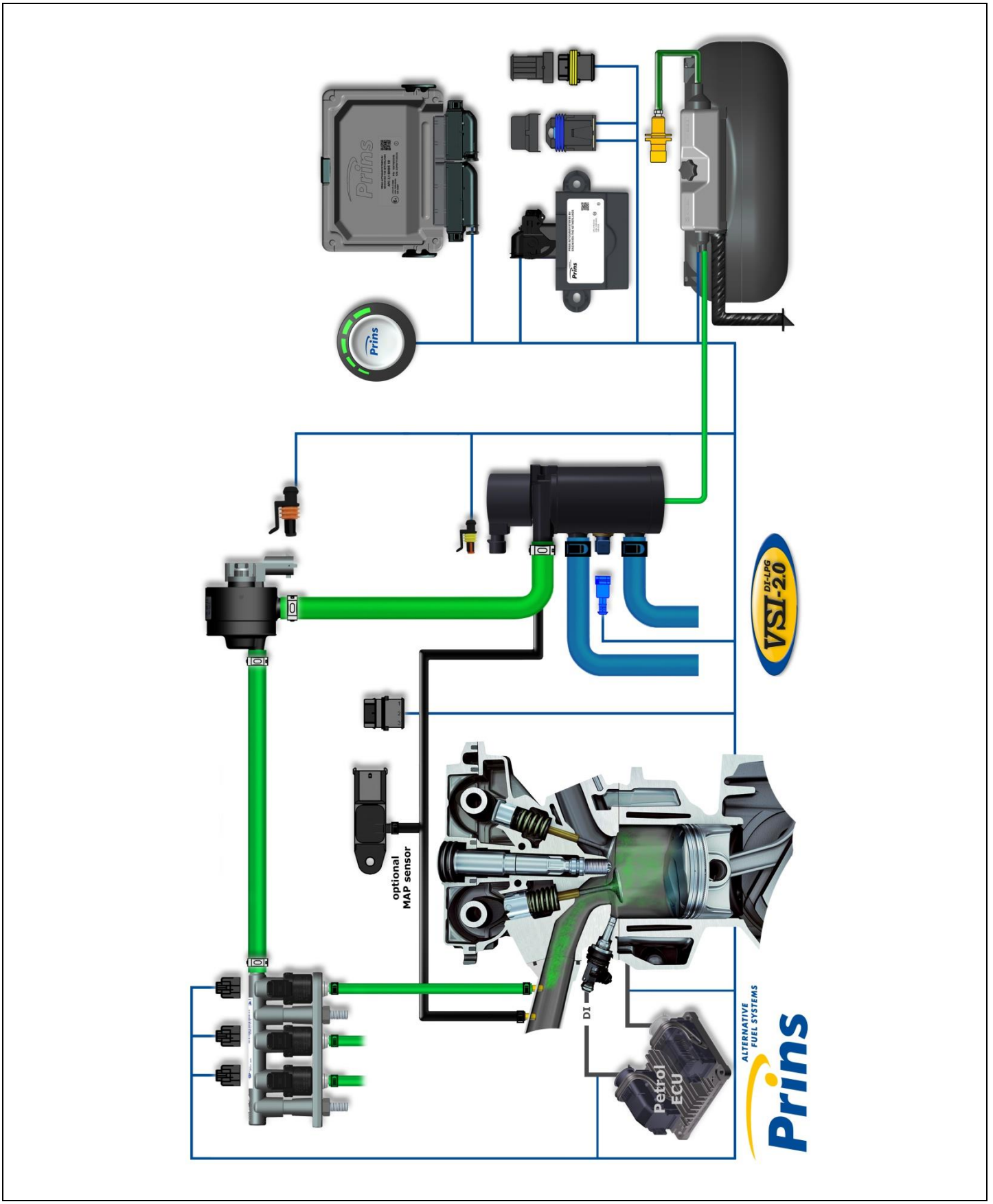
EXPLANATION OF SYMBOLS:

= IMPORTANT, CAUTION

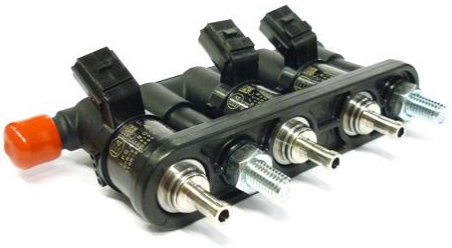


= WEAR SAFETY GOGGLES

Basic System Overview



VSI approval numbers

	
Reducer eVP-500 : E4-67R-010358	Injector rail Prins : LPG E4-67R-010093 CNG E4-110R-000021
 	
Filter unit T1 / T2 Prins : LPG E4-67R-010096 CNG E4-110R-000028 Filter unit Keihin: LPG E4-67R-010177 CNG E4-110R-000091	Injector Keihin KN9 : LPG E4-67R-010310 CNG E4-110R-000295
	
Prins AFC : E4-67R-010098 E4-10R-030507	Tubithor : LPG E13-67R-010145 CNG E13-110R-000017 Rubia : LPG E4-67R-010068 CNG E4-110R-000003 WinLas : LPG E37-67R-010140 CNG E37-110R-000012 Thunderflex LPG E24-67R-010018 CNG E24-110R-000040

VSI component location overview

(example Ford Transit Courier RHD 2015)

Rail (3-cylinder)

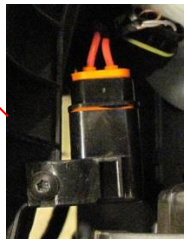
Filter

eVP

AFC

Petrol ECU

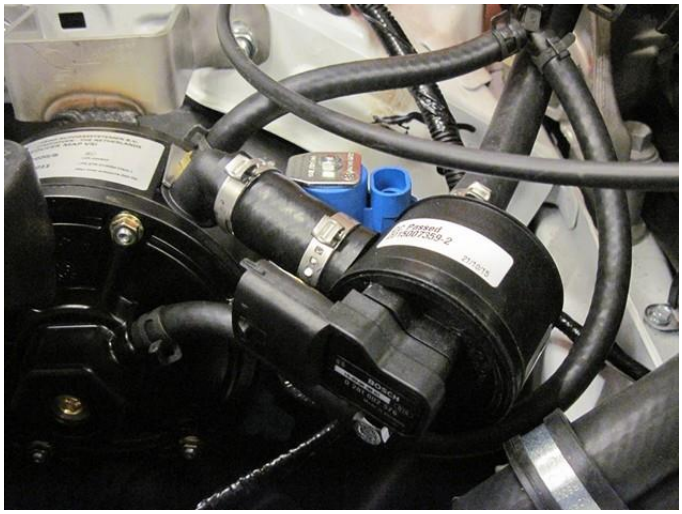
Fuse



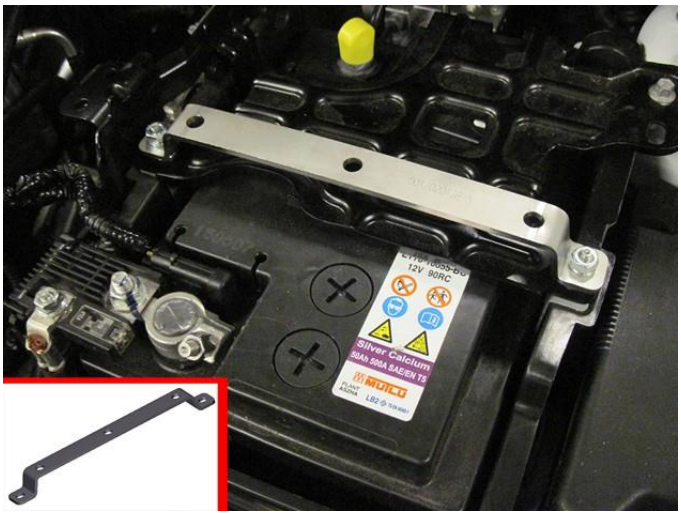
R115 approval sticker:
Right side centre door post

Mounting examples

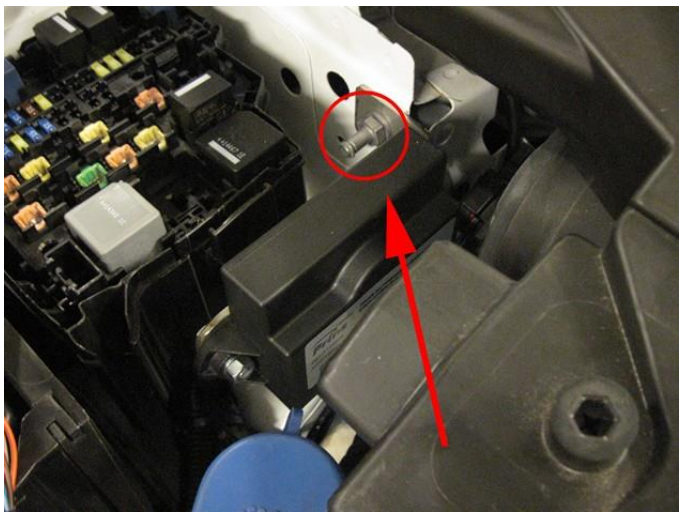
(examples Ford Transit Courier RHD 2015)



eVP can be mounted on the same location, together with filter.



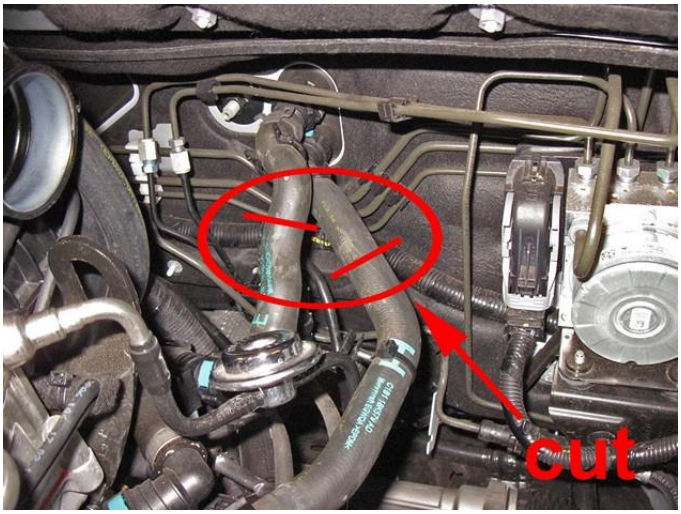
AFC

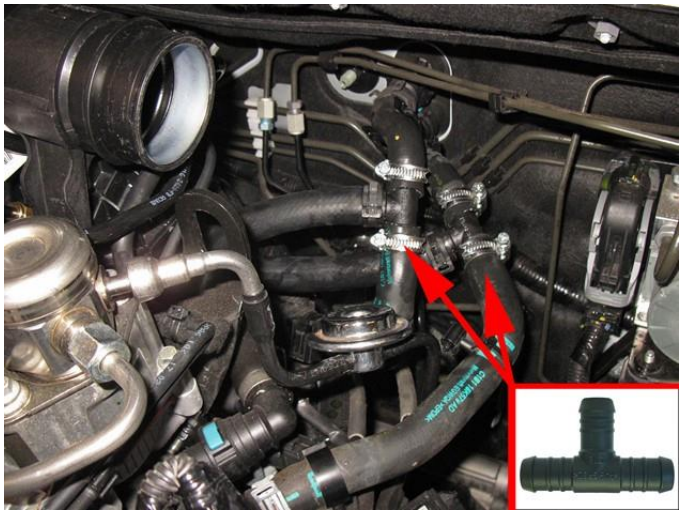


Injection module

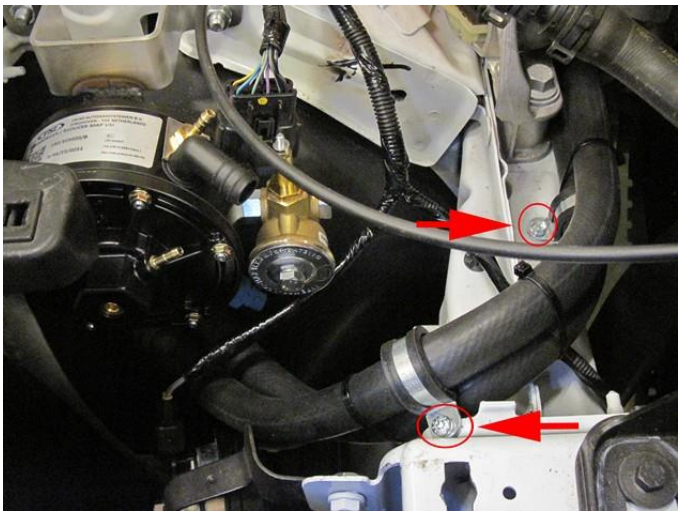
Water connections

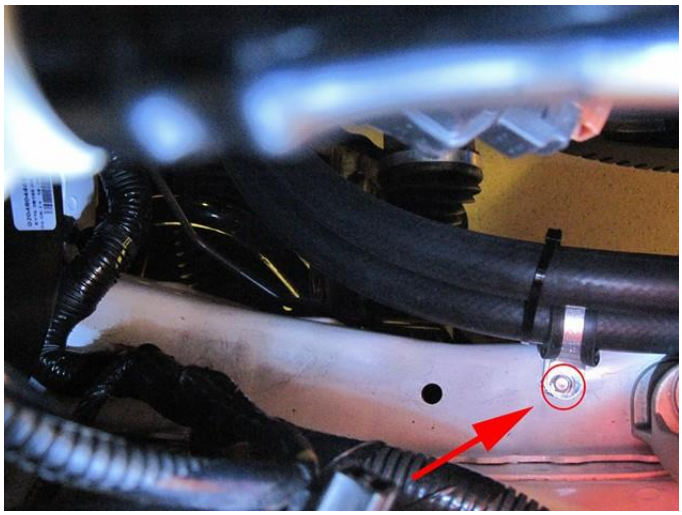
(examples Ford Transit Courier RHD 2015)



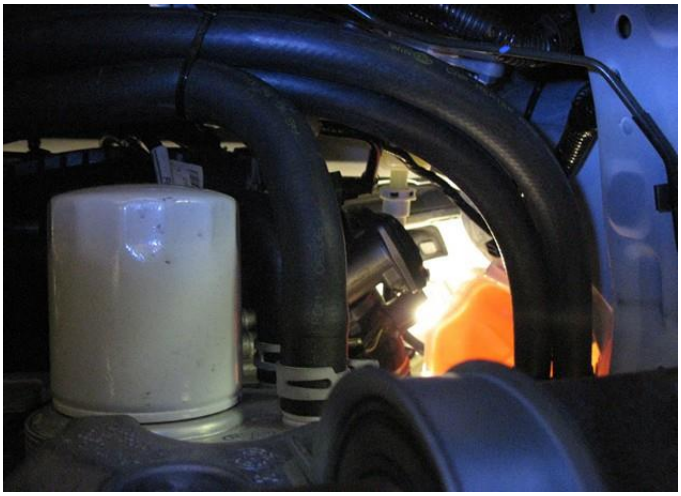


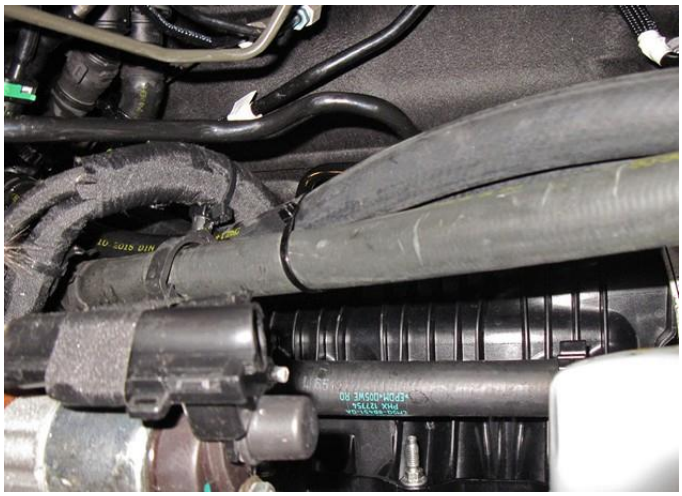
Cut the water hoses and mount the T-pieces.





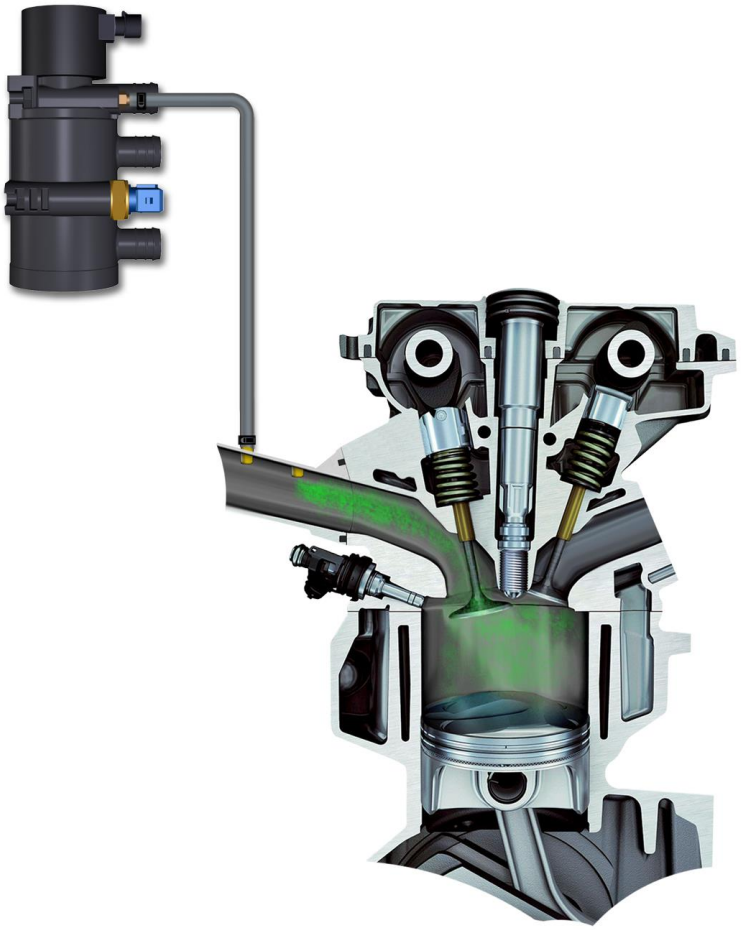
Water hose routing with clamps.

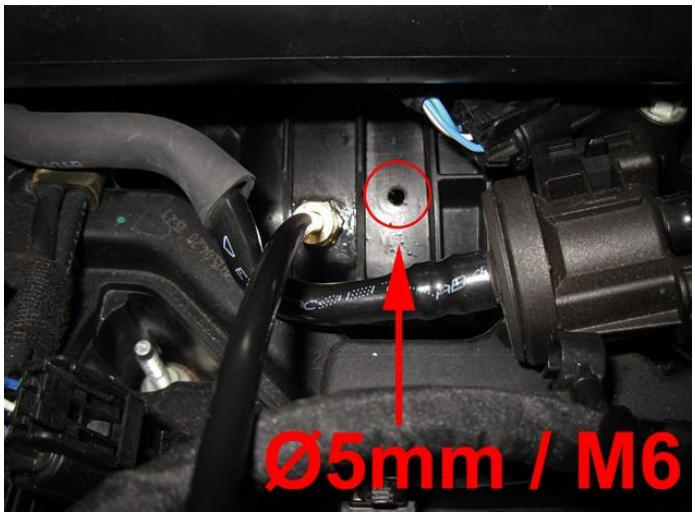


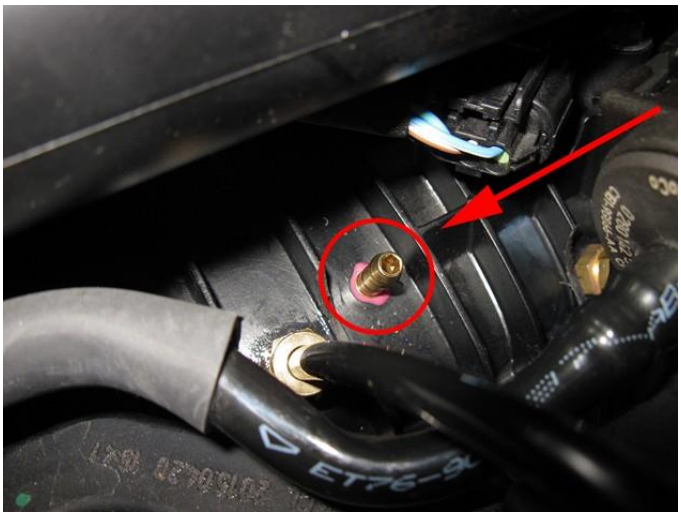


Water hose routing.

Overpressure connection



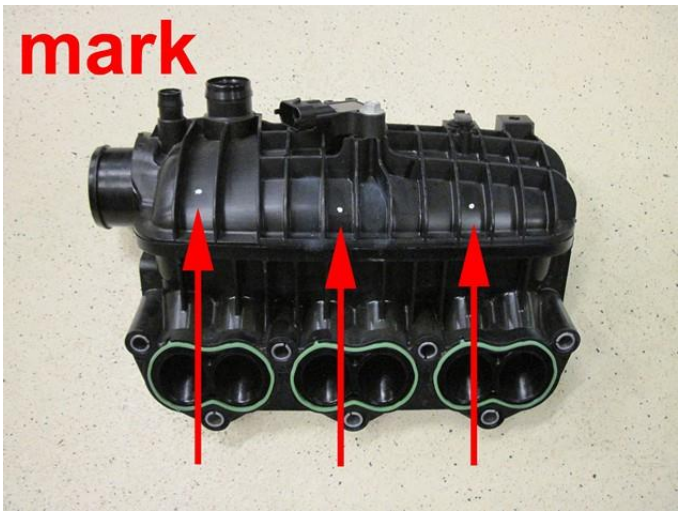


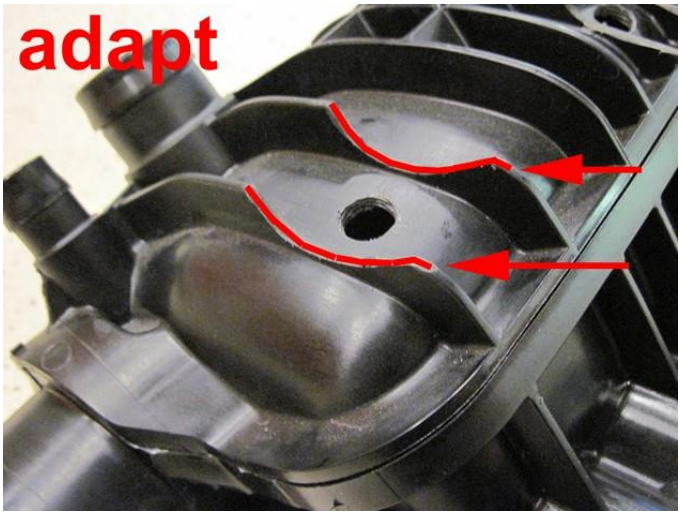


With manifold removed, drill hole Ø5mm and cut thread M6. Mount manifold coupling with a locking compound.

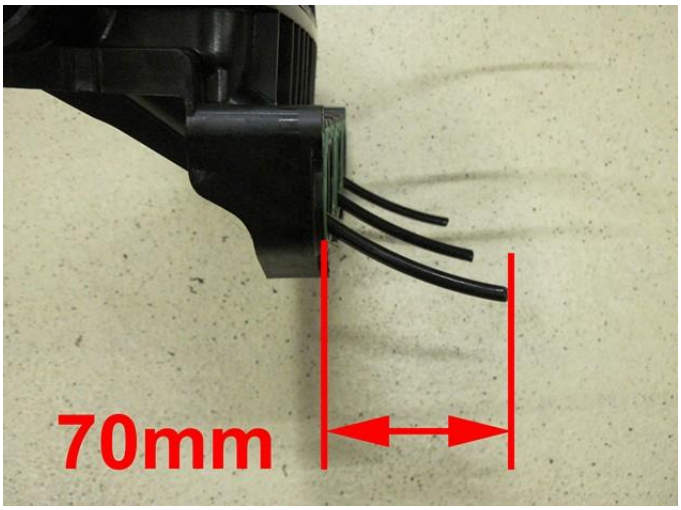
Mounting the inlet manifold couplings 1 (remove inlet manifold)

Drill **3x** holes of **9mm** in the inlet manifold. Cut **M10x1** thread in these holes.
Place the VSI couplings with a lock compound in the inlet manifold.
Watch out that the lock compound doesn't come inside the VSI couplings.



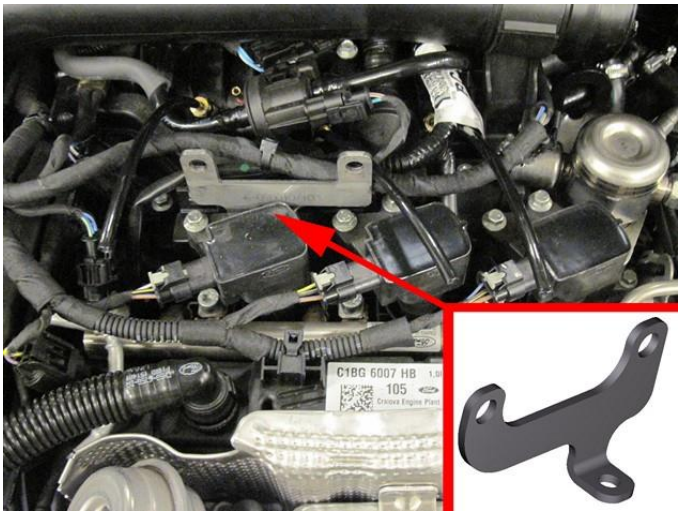


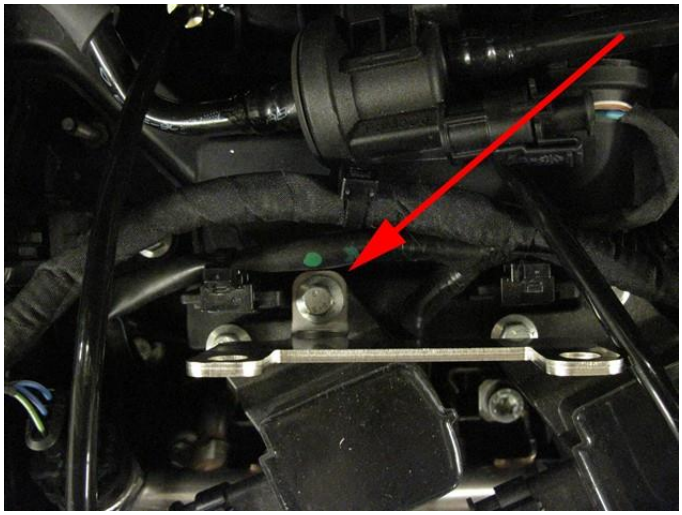
Adapt manifold around all just drilled holes. Mount the couplings with a locking compound.



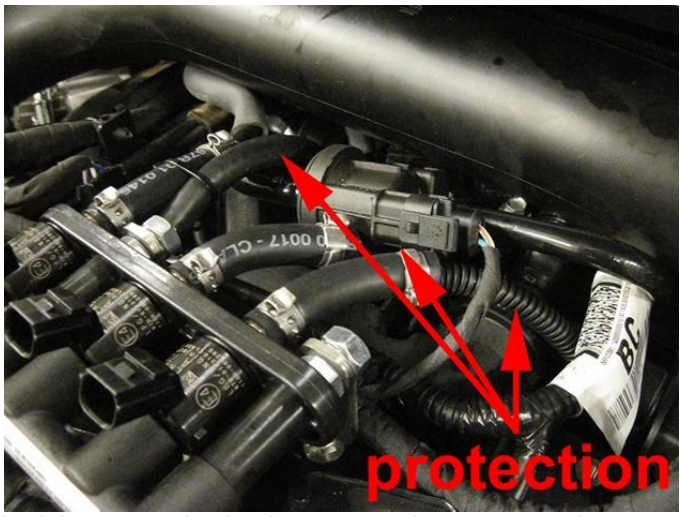
Mounting the inlet manifold couplings 2

Mounting the VSI injector rail

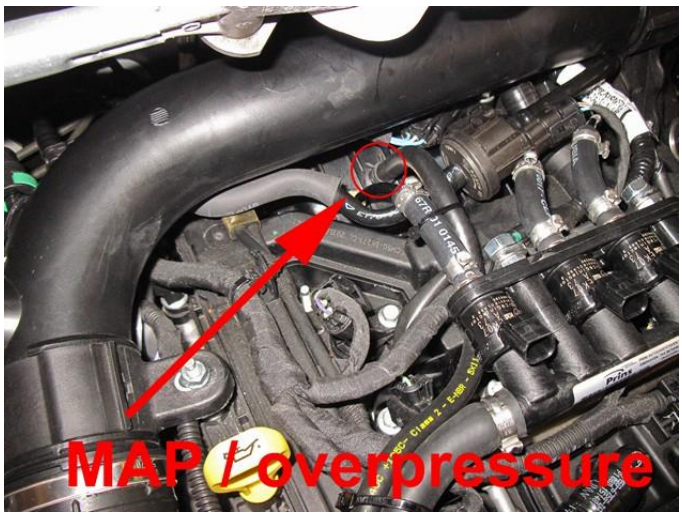




Mount the bracket with the original bolt from the ignition coil from cylinder 1.



Mount the rail and hoses. For the connection between the injectors and nylon hoses, use the 6mm LPG hose. Use protection around the nylon hoses.



Mount the 11mm LPG hose from the filter to the rail. Mount the 5mm LPG hose from the overpressure to the manifold coupling. Both hoses have the same routing (example Ford Transit Connect).

LPG hoses

(example lenghts Ford Transit Connect 2015)

Hose (Ø..mm)	*From component*	*To component*	*Hose length (cm)*
16	eVP-500	Prins filter unit	5
11	Prins filter unit	VSI injector rail	80
5	eVP-500 overpressure	Inlet manifold coupling (vacuum)	90
6	VSI injector 1	Nylon hose cyl.1	6
6	VSI injector 2	Nylon hose cyl.2	6
6	VSI injector 3	Nylon hose cyl.3	6

General info.

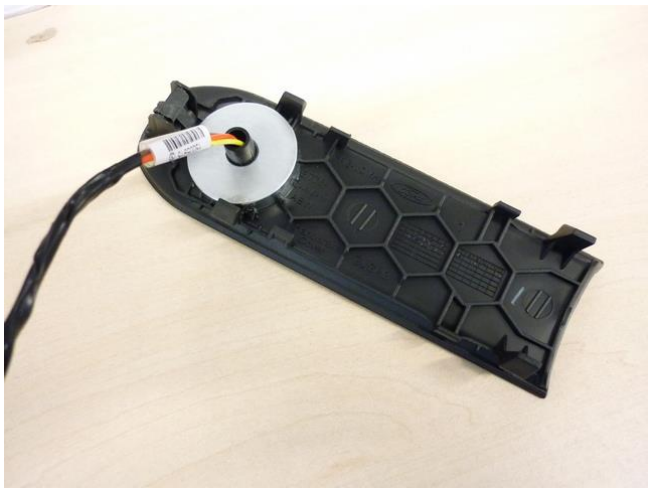
Cut the LPG hoses on length.
Cut the nylon hoses on length, make sure that the inlet of the nylon hose faces the injector outlet.

Please observe that there is no damage or fouling to the hoses.

Mounting the fuel selection switch / Grommet

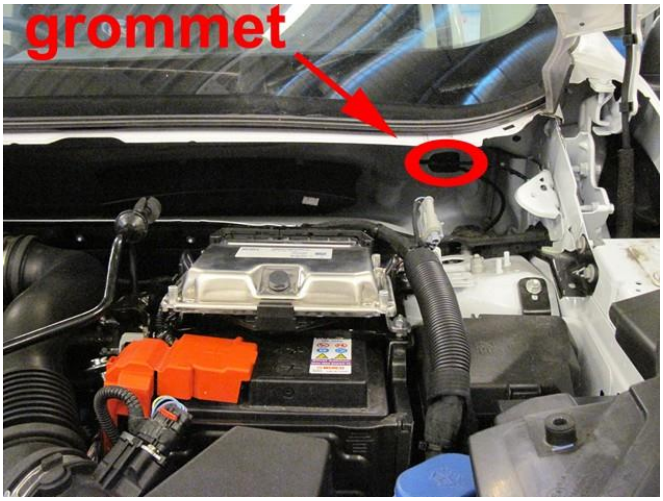
(Examples from Ford Transit Courier 2015 RHD)

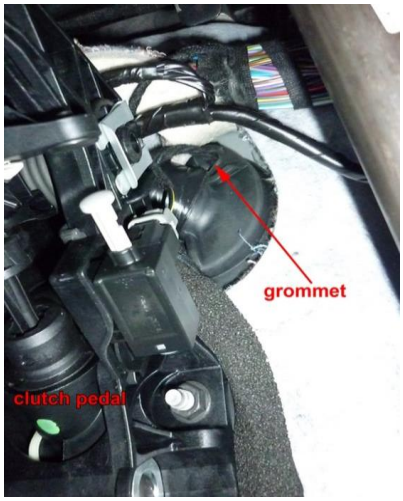
When mounting the switch, only push on its sides. Pushing the switch hard in the centre may result in damage to the switch.



Option 1 (countersunk), drill hole Ø32mm and mount cup.

Option 2: on top, drill hole 8.3mm.



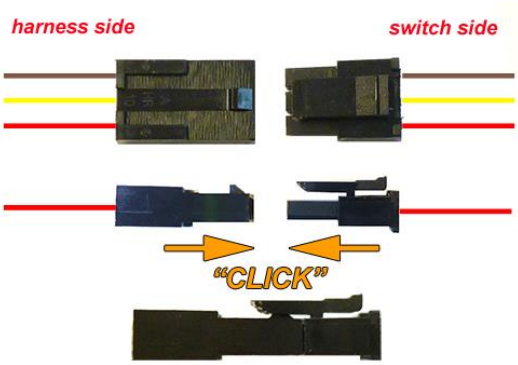


Examples grommet location from Ford Transit Courier 2015 RHD

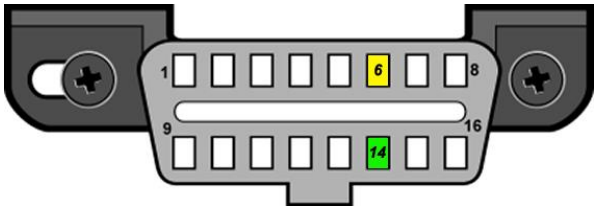
Electrical connections

Driver room

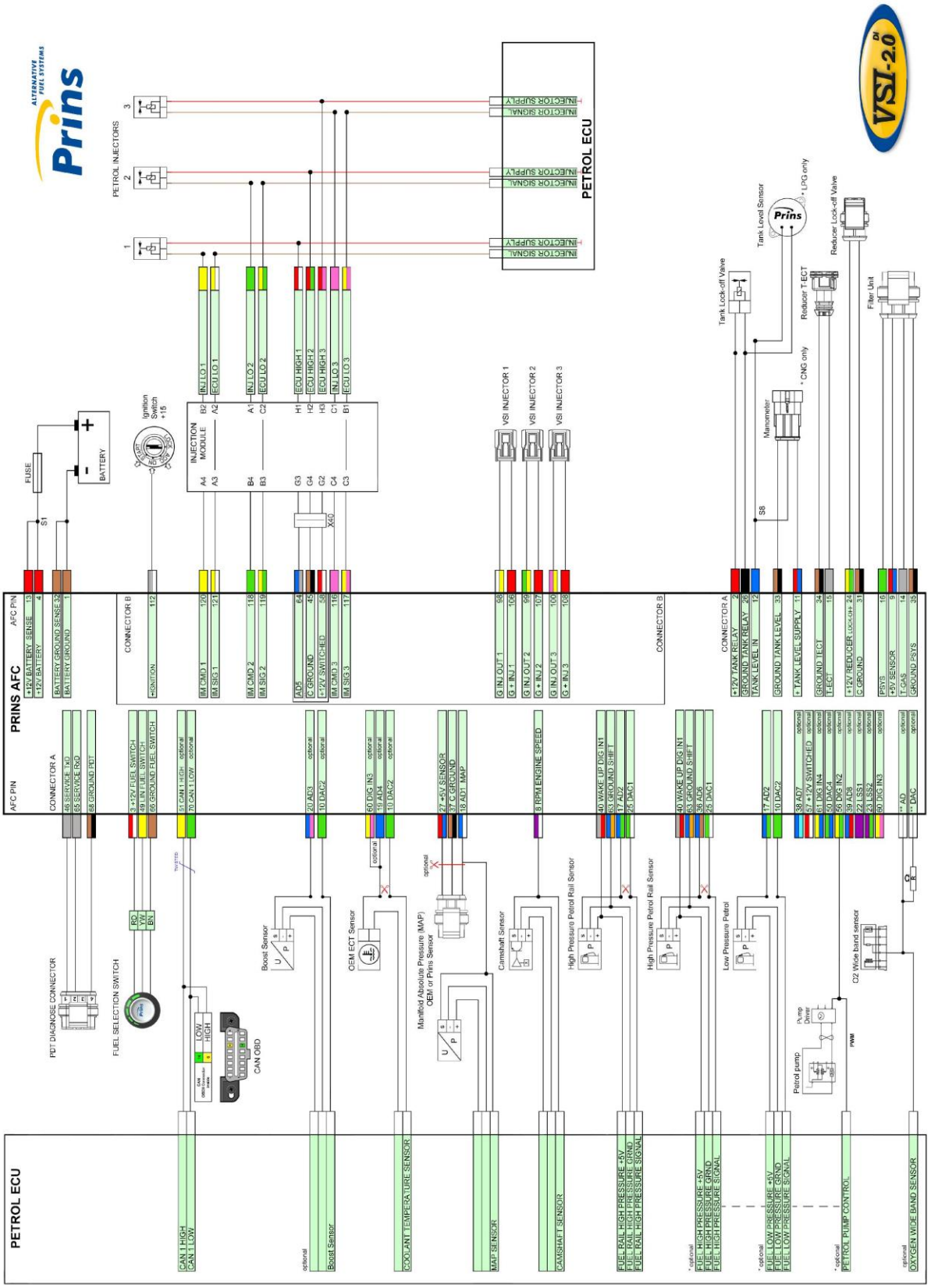
3-pole micro connector				*Connect to* the Prins fuel selection switch
66	Ground fuel switch		Brown-black	
3	+12V fuel switch		Red-white	
49	LIN fuel switch		Yellow	



				Connect to EOBD diagnose connector.
51	CAN1 High		Yellow	Pin : 6
70	CAN1 Low		Green	Pin : 14



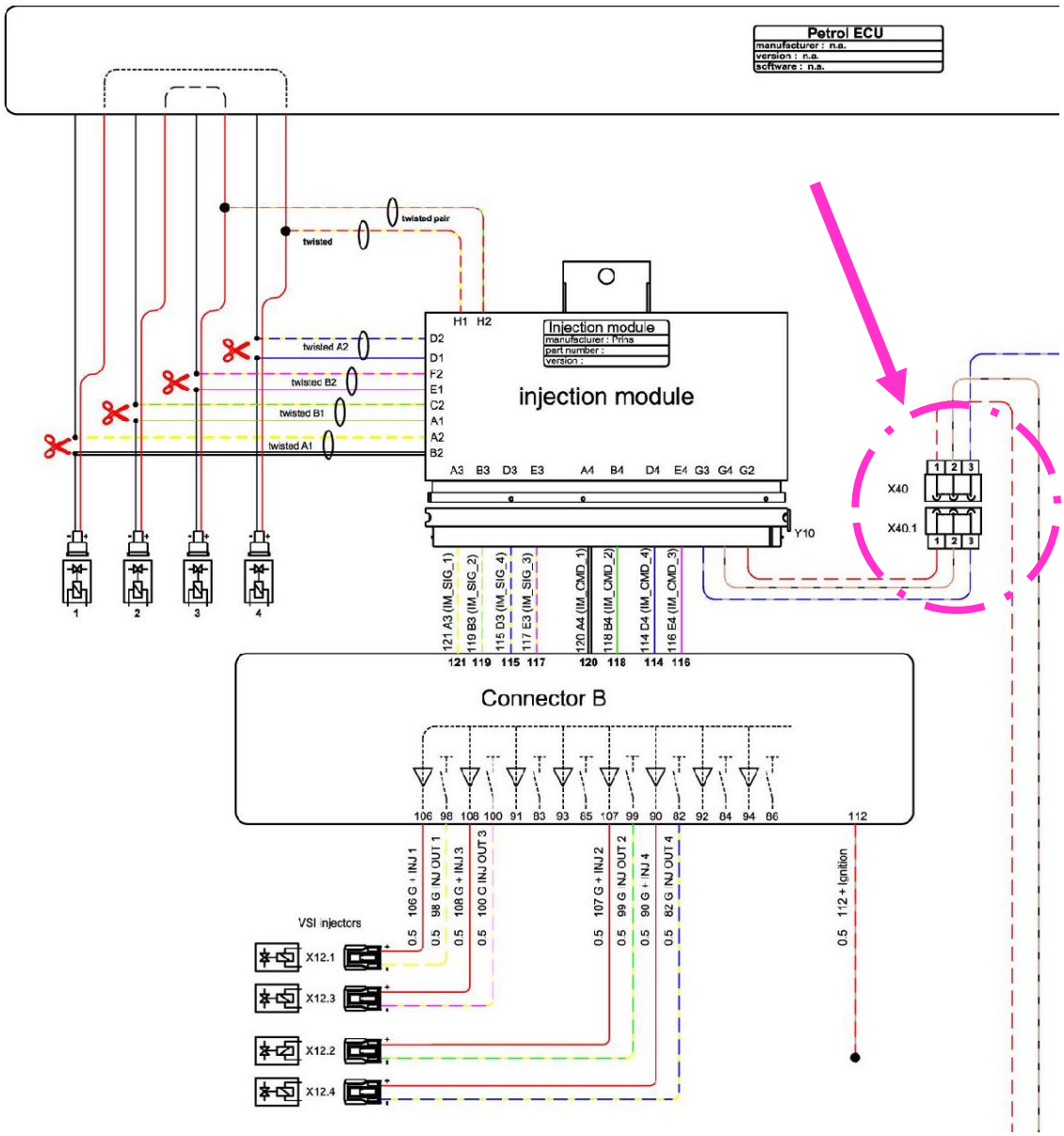
Basic Wiring Diagram



Electrical connections

Check and measure the wiring in case of changes in the cars wiring colours.

Connector Injection Module

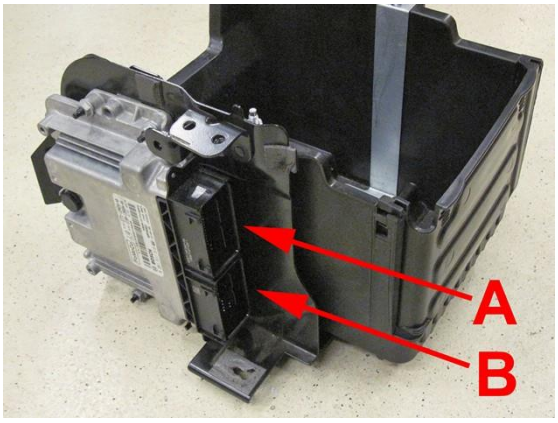


98	98 G INJ OUT **1**		**White-yellow**	Connector VSI-injector to cylinder **1**. Timing belt/chain side
106	106 G + INJ 1		**red**	

99	99 G INJ OUT **2**		**Green-yellow**	Connector VSI-injector to cylinder **2**.
107	107 G + INJ 2		**red**	

100	100 G INJ OUT **3**		**Pink-yellow**	Connector VSI-injector to cylinder **3**.
108	108 G + INJ 3		**red**	

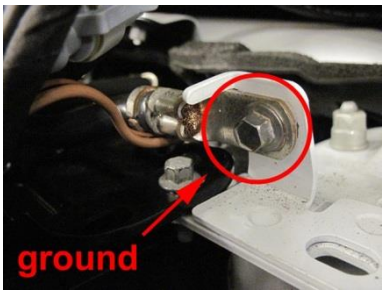
Petrol ECU connectors



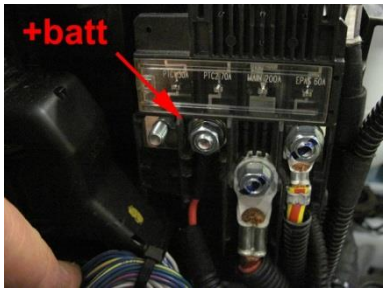
Electrical connections

Check and measure the wiring in case of changes in the cars wiring colours.

32 Ground sense 1 Ground battery		Brown	*Connect to the '–' of the battery; use a ring terminal or solder:* Wire colour: **Black** Wire location: **On left suspension strut, original ground**



4 +12V Battery		Red	*Connect to the '+' of the battery; use a ring terminal or solder:* Wire colour: **Red** Wire location: **Fuse connections onto battery +**



Do not place the fuse in the holder before having completed the installation of the LPG system.

Electrical connections

Check and measure the wiring in case of changes in the cars wiring colours.

⚠ For measuring the petrol injectors :

Interrupt each petrol injector control wire (injector min)
Each VSI wire has a petrol injector / cylinder number printed on the wire, connect this wire to the corresponding petrol injector / cylinder.
Connect the **bicoloured** VSI measuring wire to the **ecu side** (wire code: ecu-lo).
Connect the **corresponding full coloured** VSI wire to the **petrol injector side** (wire code: inj-lo).
See diagrams: Installation manual general part 1 / 2.

Attention:
Each bicoloured measuring wire corresponds to a specific LPG injector and petrol injector / cylinder number.
Do not interchange the wires.

Petrol injector **cyl. 1**		
INJ LO 1	White	Injector side
ECU LO 1	**White-yellow**	ECU side
IM pos. B2 / A2		Colour : **Yellow-blue** Location : Petrol ECU, connector **B**, pin **84**

ECU HIGH **1**	**Red-white**	Injector side
IM pos. H1		Colour : **Grey-blue** Location : Petrol ECU, connector **B**, pin **91**

Petrol injector **cyl. 2**		
INJ LO 2	Green	Injector side
ECU LO 2	**Green-yellow**	ECU side
IM pos. A1 / C2		Colour : **Blue-red** Location : Petrol ECU, connector **B**, pin **82**

ECU HIGH **2**	**Red-green**	Injector side
IM pos. H2		Colour : Pink-yellow Location : Petrol ECU, connector **B**, pin **92**

Petrol injector **cyl. 3**		
INJ LO 3	Pink	Injector side
ECU LO 3	**Pink-yellow**	ECU side
IM pos. E1 / F2		Colour : **Grey-blue** Location : Petrol ECU, connector **B**, pin **76**

ECU HIGH **3**	**Red-pink**	Injector side
IM pos. H3		Colour : **Blue-grey** Location : Petrol ECU, connector **B**, pin **93**

Electrical connections

Check and measure the wiring in case of changes in the cars wiring colours.

3-pole connector			*For measuring the inlet manifold pressure (MAP).* Or only blue-white to the OEM MAP sensor. Cut-off connector.
27	+5V Sensor	Red-blue	***insulate***
37	C ground	Brown-black	***insulate***
18	AD1	Blue-white	Wire colour : **Blue-grey** Wire location : Petrol ECU, connector **B**, pin **35**

17 & 25			*High pressure petrol sensor signal interruption.* Wire colour : **Blue-brown** Wire location : Petrol ECU, connector **B**, pin **38**
17	AD 2	Blue-green	Sensor side
25	DAC 1	Green-white	Petrol ecu side

			High pressure petrol sensor ground. Wire colour : **Brown-white** Wire location : Petrol ECU, connector **B**, pin **22**
63	Ground Shift	Blue-orange	

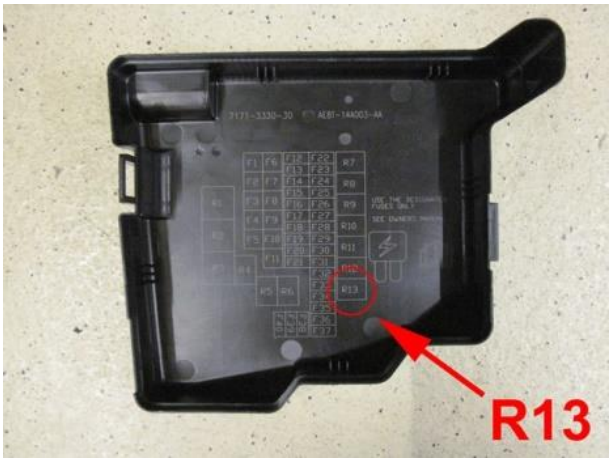
			High pressure petrol sensor supply 5V Wire colour : **Grey** Wire location : Petrol ECU, connector **B**, pin **3**
40	Wake-up	Grey-red	

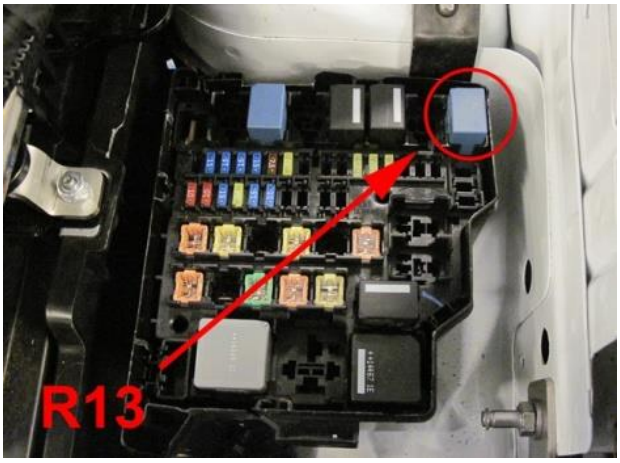
			For measuring the engine speed signal. Wire colour : Wire location : Petrol ECU, connector **B**, pin **36**
8	RPM	Purple-white	

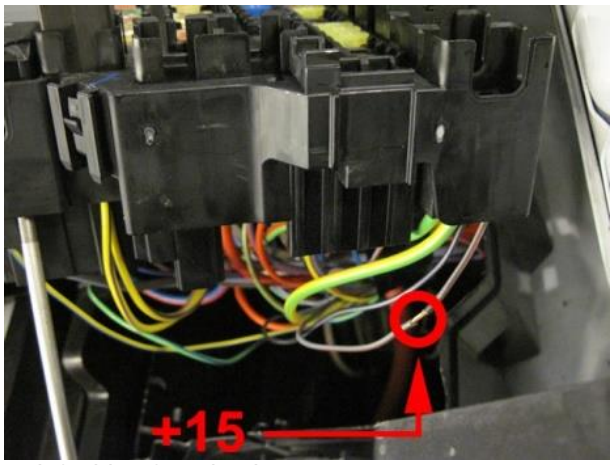
Electrical connections

Check and measure the wiring in case of changes in the cars wiring colours.

112			*Connect to +ignition / contact+ (+15).* *Do not place the fuses in the holder before having completed the installation of the LPG system.* Wire colour : **Grey-brown** Wire location : **In fuse/relay box, see pictures**
112 + Ignition		Red-grey	

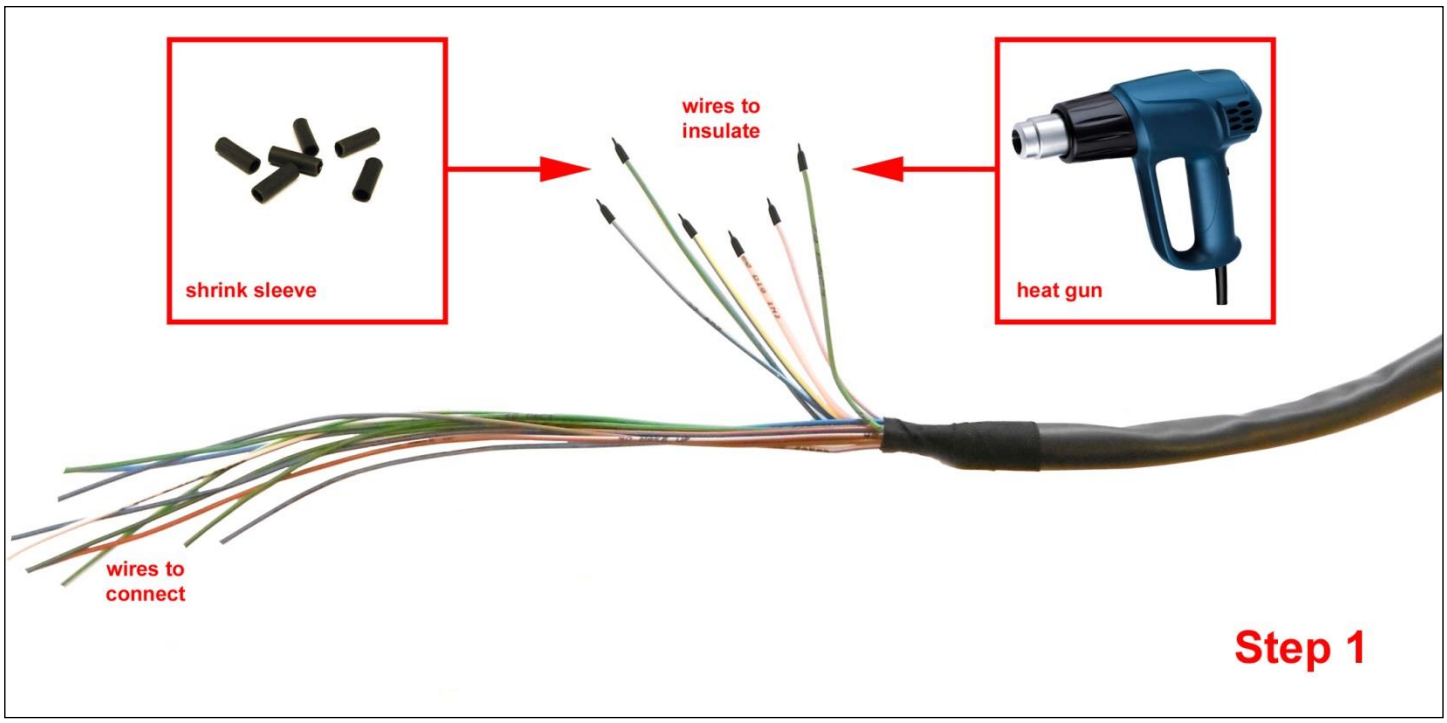


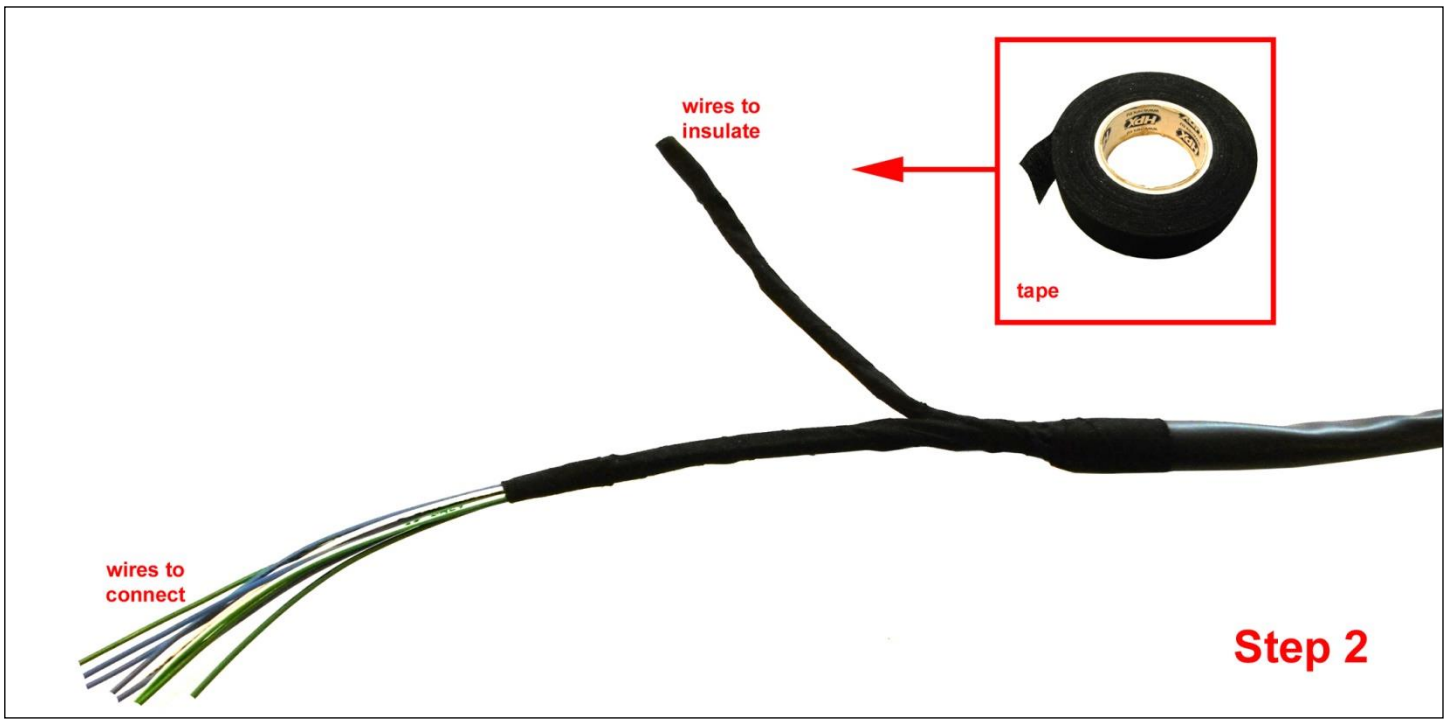




+Ignition in fuse/relay box on left side of engine bay.

Electrical connections – How to insulate not used wires





See next page, wires to insulate

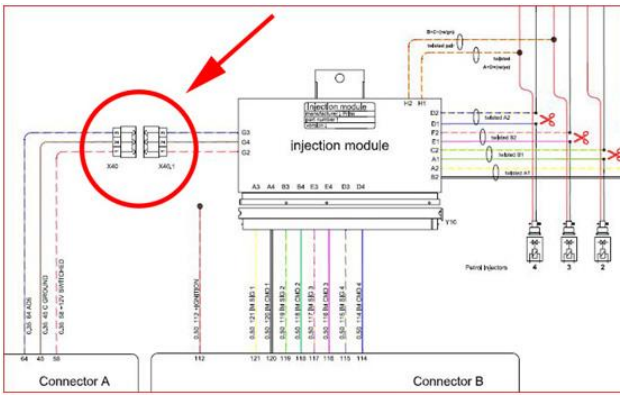
Electrical connections – Not used wires to insulate

10	DAC 2		Green	
19	AD4		Blue	
20	AD3		Blue-pink	
22	LSS1		Purple	
23	LSS2		Purple-green	
25	DAC 1		Green-white	
36	AD 6		Blue-brown	
38	AD7		Blue-light Blue	
39	AD8		Blue-red	
43	+12 Valve 2		Red-white	
50	DAC4		Green-blue	
56	DI2		Yellow-green	
60	DIG IN3		Yellow-pink	
61	DIG IN4		Yellow-blue	
62	C Ground		Brown-black	
74	DAC3		Green-pink	

Insulate additional loose wires

Electrical connections

Connectors in wiring loom

2-pole blue connector 15 T-ECT 34 Ground T-ECT	 Grey Brown-black	*For measuring the engine coolant temperature (Tect).* Connect the connector to the reducer temperature sensor.
4-pole connector 35 Ground Psys 14 T-Gas 9 +5 Volt sensor 16 Psys	 Brown-black Grey Red-blue Green	*For measuring gas pressure and temperature.* Connect the connector to the filter unit sensor.
2-pole connector 24 +12V reducer lock-off 31 C Ground	 Yellow-green Brown-black	Connect the connector to the reducer lock-off valve.
4-pole connector 46 Service TxD 65 Service RxD 68 Ground PDT	 Grey Grey Brown-black	Diagnose connector.
Tank wiring loom 2 +12V Tank relay 12 Tank level IN 26 Ground tank relay	 red blue black	Connect to the tank lock-off. Connect the tank level gauge. Connect to the tank lock-off.
Wiring loom link 45 C ground 58 +12V switched 64 AD5	 Brown–black Red–white Blue-grey	Connection from AFC connector A to connector B. 

Checklist after installation

1. Connect the Prins Diagnostic Tool and run the VSI diagnostic program.
   Install the VSI fuse, turn the ignition key in the accessory position.
   When working on the car, beware of moving and rotating parts in the engine compartment.

2. When commissioning the LPG system, you must activate the AFC with the diagnostic software.
   When the AFC has not been activated, the switch will keep blinking.
   To activate the AFC, select function *activate ECM* in the diagnostic software.

3. Check whether the program in the AFC matches with the car (dedicated engine set):
   Refer the car description in the diagnostic software (Basic → Identification) and compare these with the set number.

4. The system will switch over to LPG as soon as the temperature of the coolant becomes higher than parameter 70 - Switch over ECT.

5. Check all components and connections for any gas leakage (use a LPG leak detector device or a fluid detection like soap). Caution for moving and rotating parts in the engine compartment!

6. Let the engine run warm on petrol >80°C.
   Check if the reducer heats up.
   Check the engine signals, petrol injection time, RPM, ECT, lambda, MAP signal and petrol pressure signal.
   Let the engine run idle on LPG.
   Adjust the reducer pressure.
   Refer to *Basic → System* in the diagnostic software for the idle level value set.
   Adjust the reducer pressure in such a way that the pressure measured (P-sys) equals the idle level value.
   Turn the socket-head screw at the front of the reducer to adjust the pressure.
   An error code will be generated whenever the pressure variation is too high.

7. Use the diagnostic software to check again all input and output signals.

8. Check the system for error codes and solve these, if required.
   Check the petrol ECM for EOBD error codes.
   Place the protection connector on the VSI communication connector.

9. Take a test drive and check the drivability on LPG and petrol.

ALTERNATIVE FUEL SYSTEMS
Prins